

5.4 Factoring Polynomials

GCF

ex 1:

$$3x^2 + 6x$$

$$3x(x + 2)$$

Regular

$$ax^2 + bx + c$$

ex 2:

$$x^2 - 2x - 8$$

$$(x - 4)(x + 2)$$

-8

-4 +2

-2

+c same sign

-c different signs

ex 3:

$$6x^2 - 11x - 10$$

$$6x^2 - 15x + 4x - 10$$

$$3x(2x - 5) + 2(2x - 5)$$

$$(2x - 5)(3x + 2)$$

$$\begin{array}{r} -60 \\ -15 \quad 4 \\ -11 \end{array}$$

ex 4:

$$8x^2 + 14x + 5$$

$$8x^2 + 10x + 4x + 5$$

$$2x(4x + 5) + 1(4x + 5)$$

$$(2x + 1)(4x + 5)$$

$$\begin{array}{r} 40 \\ 10 \quad 4 \\ 14 \end{array}$$

Patterns

$$i. \quad a^2 - b^2 = (a + b)(a - b)$$

$$ii. \quad a^2 - 2ab + b^2 = (a - b)^2$$

$$iii. \quad a^2 + 2ab + b^2 = (a + b)^2$$

ex 5:

$$4m^2 + 4m + 1$$

$$(2m + 1)^2$$

ex 6:

$$x^3 - 12x^2 + 36x$$

$$x(x^2 - 12x + 36)$$

$$x(x - 6)^2$$

ex 7:

$$y^2 - 49$$

$$(y+7)(y-7)$$

ex 8:

$$4x^{10} - 9y^8$$

$$(2x^5)^2 - (3y^4)^2$$

$$(2x^5 + 3y^4)(2x^5 - 3y^4)$$

$$x^2 - 49$$

$$(x)^2 - (7)^2$$

ex 9:

$$4x^{2n} - 16y^{4n}$$

$$4(x^{2n} - 4y^{4n})$$

$$(x^n)^2 - (2y^{2n})^2$$

$$4(x^n - 2y^{2n})(x^n + 2y^{2n})$$

If a problem is not factorable,
then write:

Prime

2 New Patterns

iv. $a^3 \oplus b^3 = (a \oplus b)(a^2 - ab + b^2)$
Sum of cubes

v. $a^3 \ominus b^3 = (a \ominus b)(a^2 + ab + b^2)$
Difference of cubes

$$\begin{array}{ll} 1^3 = 1 & 4^3 = 64 \\ 2^3 = 8 & 5^3 = 125 \\ 3^3 = 27 & 6^3 = 216 \end{array}$$

ex 10:

$$8u^3 + v^3$$

$$(2u)^3 + (v)^3$$

$$a = 2u$$

$$b = v$$

$$(2u+v)(4u^2 - 2uv + v^2)$$

ex 11:

$$27x^3 + y^3$$

$$(3x)^3 + (y)^3$$

$$a = 3x$$

$$b = y$$

$$(3x+y)(9x^2 - 3xy + y^2)$$

ex 12: $a = 4$
 $b = x$
 $64 - x^3$

$$(4-x)(16+4x+x^2)$$

ex 13:
 $x^6 - y^6$

$$(x^3)^2 - (y^3)^2$$

$$(x^3 + y^3)(x^3 - y^3)$$

$$(x+y)(x^2-xy+y^2)(x-y)(x^2+xy+y^2)$$

Four term (or five term) Polynomials
 (Grouping)

ex 14:

$$xy + 5x + 3y + 15$$

ex 15:

$$ax + bx + a + b$$

HW:
p242-243
15-39odd